PORTABLE RECIPROCATING SAW

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Application June 27, 1952, Serial No. 295,902
3 Claims. (Cl. 74—60)

Our invention relates generally to improvements in cutting tool assemblages, and relates more particularly to improvements in the construction and operation of high speed power driven portable reciprocating cutting units.

The primary object of the present invention is to provide a simple, compact and durable portable reciprocating cutting device which is readily manipulable to cut various kinds of material along straight, curved, or irregular lines of severance, with the aid of a saw blade, file, or other type of cutting tool.

Some of the more important specific objects of the invention are as follows:

To provide a reciprocating cutting unit of rugged construction in which all parts which are subject to most wear due to severe handling, are readily accessible and replaceable.

To provide a small but powerful sawing tool which is operable at high speed to cut either wood, metal, or composite materials in any desired direction and into varied shapes.

To provide a high speed power driven portable sawing assemblage in which friction losses are reduced to a minimum with the aid of extensive anti-friction bearings.

To provide an electric motor propelled reciprocating saw of utmost simplicity which may be readily assembled or dismantled, and wherein the rotation of the motor rotor is converted into reciprocating motion of the saw blade by well protected and efficient transmission mechanism.

To provide a compact portable reciprocating saw unit in which the cut may be started within the bounding margins of flat sheets, without the aid of drill holes or the like.

To provide a portable power driven reciprocating sawing device, of light weight but of sturdy construction adapted for diverse uses, and which may be manufactured and operated at minimum cost.

These and other more specific objects and advantages of the invention will be apparent from the following description from which it will be noted that the gist of the improvement is the provision of a portable reciprocating saw unit comprising a casing, an electric motor secured to one end of the casing and having a rotor adjoining the casing interior, a saw blade protruding from the opposite end of the casing, an elongated shaft member carrying the blade, and being guided for longitudinal reciprocation within the casing, a rotary shaft journaled within the casing laterally of the reciprocable member and having a crank disposed at an oblique angle relative to the shaft axis, an arm element oscillatable along the shaft axis by the crank and being cooperative with the saw carrying member to reciprocate the blade whenever the shaft is rotated, and speed reducing gearing drivingly connecting the motor rotor with the crank shaft.

Fig. 1 is a central longitudinal section through the saw blade reciprocating mechanism of the unit and through a fragment of the actuating motor.

Fig. 2 is a front end view of the unit looking toward the reciprocating saw blade and the adjacent guide plate.

Fig. 3 is a transverse section through the same unit, taken along the line 3—3 of Fig. 1.

Fig. 4 is another transverse section through the unit taken along the line 4—4 of Fig. 1.

Fig. 5 is a diagrammatic side view of the entire unit drawn to a reduced scale, and showing the manner in which it may be applied to a flat work sheet.

While the invention is advantageously applicable to a portable electric motor driven reciprocable saw unit such as shown by way of illustration, it is not intended to unnecessarily restrict the use of the improved features by virtue of this limited showing of only one commercial embodiment; and it is also contemplated that specific descriptive terms be given the broadest possible interpretation consistent with the disclosure.

Referring to the drawing, the typical portable reciprocable saw unit shown therein comprises in general, a hollow casing 7 having an electric motor 8 secured to one end and provided with a rotor 9 adjoining the casing interior; a flat elongated saw blade 10 protruding from the opposite smaller end of the casing 7; an elongated shaft member 11 secured to and supporting the blade 10 and being guided for longitudinal reciprocation within the casing 7 in aligned front and rear guide bearings 12, 13 respectively; a rotary shaft 14 journaled in aligned front and rear bearings 15, 16 respectively, within the casing 7, and having a medial crank 17 disposed at an oblique angle relative to the shaft axis; an oscillatory arm element 18 having its lower portion journaled on a bearing 19 carried by the crank 17 while its upper portion is provided with a spherical head 20 oscillatably confined within a socket 21 secured to the shaft member 11; and a pair of intermeshing speed reducing gears 22, 23 drivingly connecting the motor rotor 9 with the crank shaft 14.

The casing 7 consists of a main section within which the bearings 12, 15 are directly confined, a front guide section 25 secured to the forward end of the main casing section 7; a rear closure section 26 for separating the interior of the main casing section from the motor 8, and a transverse medially wall 27 in which the bearings 13, 16 are supported. All of these parts are detachably interconnected by screws 28 or the like, and are formed of light but durable metal so as to reduce the weight of the portable unit to a minimum. The saw blade 10 preferably has a pointed forward end 29 adapted to pierce sheet stock 30 as illustrated in Fig. 5 when starting a cut within the boundaries of the sheet; the rear end of the blade 10 is firmly but detachably secured to the forward semi-circular end of the shaft member 11 by means of a U-shaped block 31 and a screw 32 as illustrated in Figs. 1 and 2. The block 31 is slidable confined within the front casing section 25, and the blade 10 may be disposed at a slight fixed angle relative to the central longitudinal axis of the member 11; while a guide shoe 33 having therein a slot 34 through which the saw blade extends, is swingably suspended from the front casing section 25 by aligned pivot pins 35.

The elongated shaft member 11 which carries the saw blade 10 at its semi-cylindrical front end, has its cylindrical medial portion slidable confined within the relatively long front guide bearing 12, while its rear portion is flattened at the bottom and is likewise slidable confined in the rear bearing 13 which is mounted in the casing.
wall 27 as shown in Figs. 1, 3 and 4. The front semi-
circular end of this reciprocable member 11 serves to hold
the flat saw blade 10 in a vertical plane, while the rear
flattened portion thereof functions to prevent rotation of
the member 11 about its longitudinal axis, and the socket
21 is firmly but removably attached to the bottom of the
flattened portion of the member 11 by means of cap
screws 37. The rotary crank shaft 14 is disposed later-
ally of but parallel to the shaft member 11 and is con-
strained within the casing 7 by the front roller bearing 15
and by the rear ball bearing 16 which is also mounted in
the transverse casing wall 27 beneath the guide bearing
13, as shown in Fig. 1.

The single crank 17 which is formed integral with the
shaft 14 between the bearings 15, 16, consists with the
oscillatory arm element 18 through the bearing 19 to
swing the element 18 back and forth about this bearing 19
whenever the shaft 14 is rotated, and the bearing 19 is
either of the anti-friction or ball type. The spherical
head 20 is oscillatatorily confined within the socket 21 car-
ried by the shaft member 11 and is formed integral with
a shank 38 snugly coacting with a bore in the arm ele-
ment 18 and detachably confined therein by a set screw
39, or, in the case of a flat spot 40 on the shank 38, as clearly
illustrated in Fig. 3. The oscillatory or swinging motion
of the arm element 18 and head 20 is thus positively con-
strained to the common vertical plane of the shaft 14 and
shaft member 11, by the crank 17 and socket 21.

The driving gear 22 is formed directly upon the
power shaft 42 of the electric motor rotor 9, and this
shaft 42 is likewise journaled for rotation in a ball
bearing 43 mounted in the casing closure 26, while the
larger driven gear 23 is removably secured to the rear
extremity of the crank shaft 14 by a Woodruff key 44 and
da disk 45 attached to the shaft 14 by means of a cap screw
46, as shown in Figs. 1 and 4. The shafts 42, 14 and the oscilla-
tory arm element 18 are therefore all mounted upon anti-
friction bearings 43, 15, 16, 19 so as to reduce friction
losses to a minimum and to insure smooth and vibration
free conversion of the rotary driving motion of the motor
8 into rapid reciprocating movement of the saw blade 10;
and when the blade attaching screw 32 has been removed
and the clamps 33 are released, the motor 8 may be
withdrawn to permit unrestricted removal of the casing
sections 26, 27 and of all of the internally normally
concealed mechanism, through the larger rear end of the
casing 7.

The propelling motor 8 is of light but powerful and
relatively standard construction, and is provided with a
pistol grip manipulating handle 47 for the unit as indi-
cated in Fig. 5. The manipulating handle 47 of the elec-
tric motor is also provided with a control switch 48, and
in order to release the shaft 14 from excessive end thrust,
the ball bearing 16 may be provided with a thrust plate
49 secured to the casing wall 27 by one or more screws
50, as depicted in Figs. 1 and 4. The usual provision for
maintaining all of the bearings amply lubricated, should
also be made, and the improved sawing unit has been
properly constructed and assembled, its normal operation
is as follows.

The electric motor 8 may be placed in operation by
actuating the switch 48, thereby causing the small gear
22 on the motor shaft 43 to rapidly revolve the larger
gear 23 and crank shaft 14, whereupon the revolving
angular crank 17 likewise rapidly oscillates the arm ele-
ment 18 and spherical head 20 to thereby reciprocate the
shaft member 11 and saw blade 10 at high speed. In
order to apply the tool to a flat or thin work sheet 30,
the saw blade 10 may be applied either to a marginal
edge of the sheet 30 or to a medial portion thereof by
initially holding the unit firmly against the material using
the larger edge of the guide shoe 33 as a fulcrum and by
thereafter pressing the starting switch 48. With the saw
blade in motion, the front end of the casing 7 should
be swung downward to cause the pointed blade end 29
to contact and pierce the sheet 30, whereverupon the unit
may be swung into vertical position with the shoe 33
flatly engaging the upper surface of the sheet 30 and the
rapidly reciprocating blade 10 may be advanced in any
desired direction to effect sawing with the aid of the
handle 25.

After considerable hard usage of the tool, the bearing
surfaces between the spherical head 20 of the oscillating
arm element 18 and the socket 21 may become worn to
such an extent as to require replacement of these parts,
and such replacement may be readily effected by merely
removing the shaft member 11 and the arm element 18
from within the casing 7, and by thereafter releasing the
screws 37, 39. Various different types of saw blades
10 may also be applied to the front end of the shaft
member 11 by merely releasing and reapplying the screw
32, in order to enable the use of the unit with sawing dif-
fferent kinds of material; and with the exception of the
prudring portion of the saw blade 10, all movable parts
of the tool are normally well concealed and protected by
the casing 7 while still being readily accessible for in-
spection and removal.

From the foregoing detailed description it will be ap-
parent that the present invention provides a portable re-
ciprocating saw which is simple, compact and durable
in construction and highly efficient in use for performing
various types of cutting. The improved unit is light in
weight but powerful, and may be readily manipulated
with utmost safety to saw either wood, metal, or com-
position materials along straight, curved or irregular lines
of cleavage with greatest ease due to the rapid reciproca-
tion of the well guided saw blade 10. The motion con-
verting mechanism of the assemblage is exceedingly simple
but rugged in structure, and dependable in action, and
the use of anti-friction bearings insures smooth operation
with least vibration and also reduces the power consump-
tion to a minimum. The entire device may be quickly
and conveniently assembled or disassembled, and may be
manufactured in various sizes for diverse uses at moderate
cost; and the term "saw blade" as used herein is intended
to include various types of cutting and abrasion tools such
as saws, files and similar implements.

It should be understood that it is not desired to limit
this invention to the exact details of construction and
operation of the portable reciprocating saw unit herein
specifically shown and described, for various modifications
within the scope of the appended claims may occur to
persons skilled in the art.

We claim:

1. In combination, a rearwardly open unitary casing
having therein lower and upper fixed front bearings,
a wall detachably secured to the open rear end of said
casing and having therein complementary lower and
upper bearings, a rotary drive shaft journalled in said
complementary lower bearings and having an intermediate
crank the axis of which is inclined relative to the shaft
axis, a longitudinally reciprocable driven shaft slidably
confined within said complementary upper bearings for
movement parallel to said drive shaft and having thereon
a socket facing said crank, an oscillatory element jour-
naled upon said crank and having a member rockably
engaging said socket and swingable in the common plane
of the axes of said parallel shafts, and means for
rotating said drive shaft to reciprocate said driven shaft.

2. In combination, a rearwardly open unitary casing
having therein lower and upper fixed front bearings,
a wall detachably secured to the open rear end of said cas-
ing and having therein complementary lower and upper
bearings, a rotary drive shaft journalled in said compo-
nementary lower bearings and having an intermediate crank
the axis of which is inclined relative to the shaft axis, a
longitudinally reciprocable driven shaft slidably confi-
ned within said complementary upper bearings for move-
ment parallel to said drive shaft and having thereon
a socket facing said crank, an oscillatory element jour-
naled upon said crank and having a member rockably engaging
said socket and swingable in the common plane of the axes of said parallel shafts, and means for rotating said drive shaft to reciprocate said driven shaft, said shafts being removable only through the rear open end of said casing.

3. In combination, a rearwardly open unitary casing having therein lower and upper fixed front bearings, a wall detachably secured to the open rear end of said casing and having therein complementary lower and upper bearings, a rotary drive shaft journalled in said complementary lower bearings and having an intermediate crank the axis of which is inclined relative to the shaft axis, a longitudinally reciprocable driven shaft slidably confined within said complementary upper bearings for movement parallel to said drive shaft, said upper rear bearing having a semi-cylindrical bearing surface and said driven shaft having a semi-cylindrical rear portion cooperate with said surface to prevent rotation of the driven shaft, a socket detachably secured to said semi-cylindrical driven shaft portion and facing said crank, an oscillatory element journalled upon said crank, a member detachably coacting with said socket to reciprocate the latter in the common plane of the axes of said parallel shafts, and means coacting with said drive shaft outwardly beyond said wall for rotating the drive shaft and reciprocating the driven shaft.

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